Systemintegration of Photovoltaic and Wind

Examples from the IEA PVPS & IEA Wind Implementing Agreements

FH-Prof. DI Hubert Fechner,
Kurt Leonhartsberger, MSc,
Technikum Wien

Systemintegration means Integration into

- The Energy/Electricity-System
- The (built) Environment

- IEA-PVPS Task 14 – High penetration of PV in Electricity Networks
- IEA-PVPS Task 15 – Building Integrated PV
  - IEA-PVPS Task 1 – Subgroup Self consumption Schemes
- IEA-Electricity Coordination group
- IEA-Wind Task 27 Small wind turbines

FACHHOCHSCHULE TECHNIKUM WIEN

The Dynamics of IEA-prospects…

IEA 2005: By 2050, however, solar's (PV and CSP) share in global power generation will still be below **2%** in all scenarios.

IEA 2009: The first IEA PV-Roadmap targets up to **11%** share of global electricity from solar PV

IEA 2014: The new IEA PV-Roadmap targets up to **16%** share of global electricity from solar PV by 2050 + 11% from CSP

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Austria‘s Role in IEA PVPS

- ExCo Deputy Chair & Management Board (H.Fechner, FH TW)
- Task 14: High Penetration of PV in Electricity Networks - Chair (Bründlinger, Mayr, AIT)

Participation:

- Task 1 – Strategy and Outreach (H.Fechner, FH TW)
- Task 12 – Environmental Health and Safety (S.Schidler; FH TW)
- Task 13 – Monitoring, Testing of PV Systems (Berger AIT, Oreski PCCL-Leoben)
- Task 15 – Building integrated PV (AIT, OFI, ASIC, FH TW) - planned

PVPS

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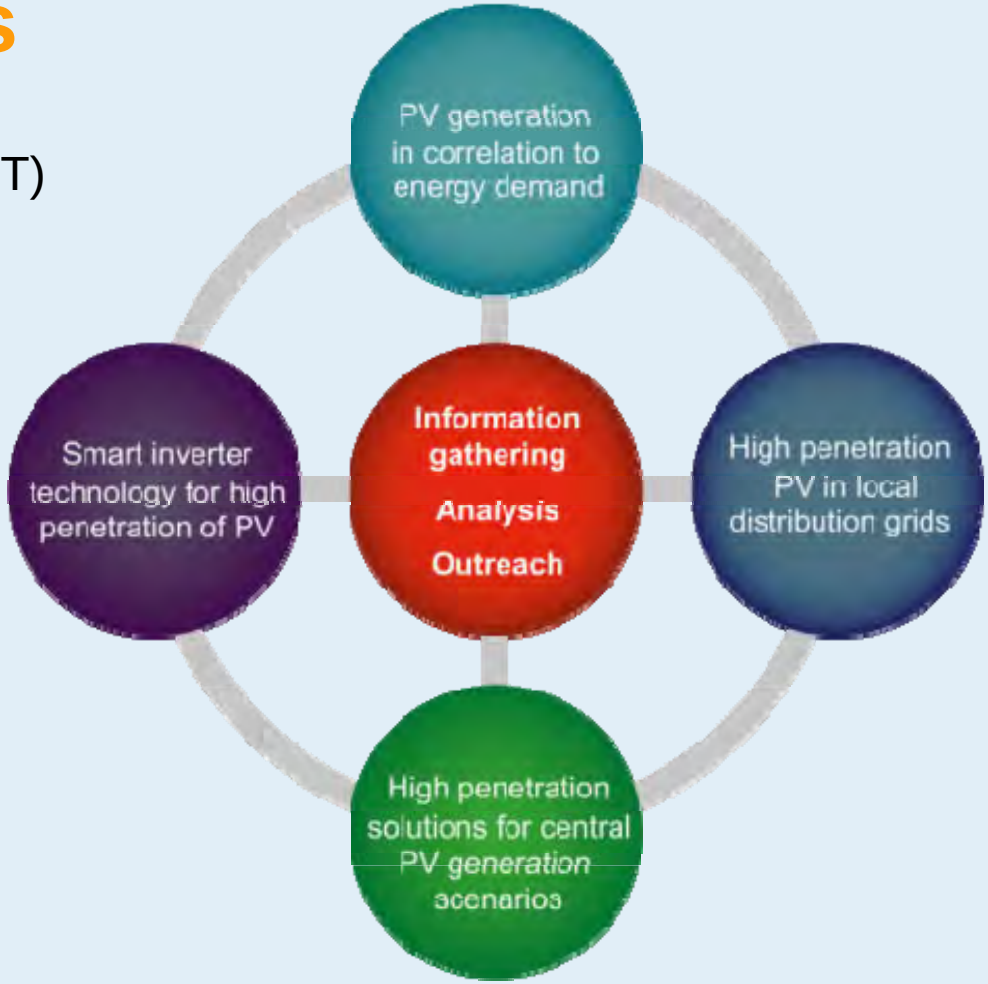
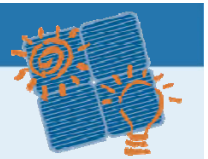
IEA-PVPS Task 14
High Penetration PV in Electricity Grids

Chair: Austria (AIT)

16 countries participating



PVPS



Motivation for PVPS Task 14 2.0
A look back…

- Task 14 has become highly visible on the international level and broadly recognized as one of the leading initiatives to bring together experts from all stakeholders in the field of PV grid integration
- A series of successful workshops with 500+ participants has been organized at locations all around the world as one of the main dissemination and networking activities.
- A number of new countries joined Task 14 during its first term (Belgium, Malaysia, EPIA, …)
- While during at the beginning of the collaboration within Task 14 in 2010, only a limited number of high penetration cases actually existed around the globe, mostly related to research or demonstration projects and field trials, the situation has changed fundamentally since then.

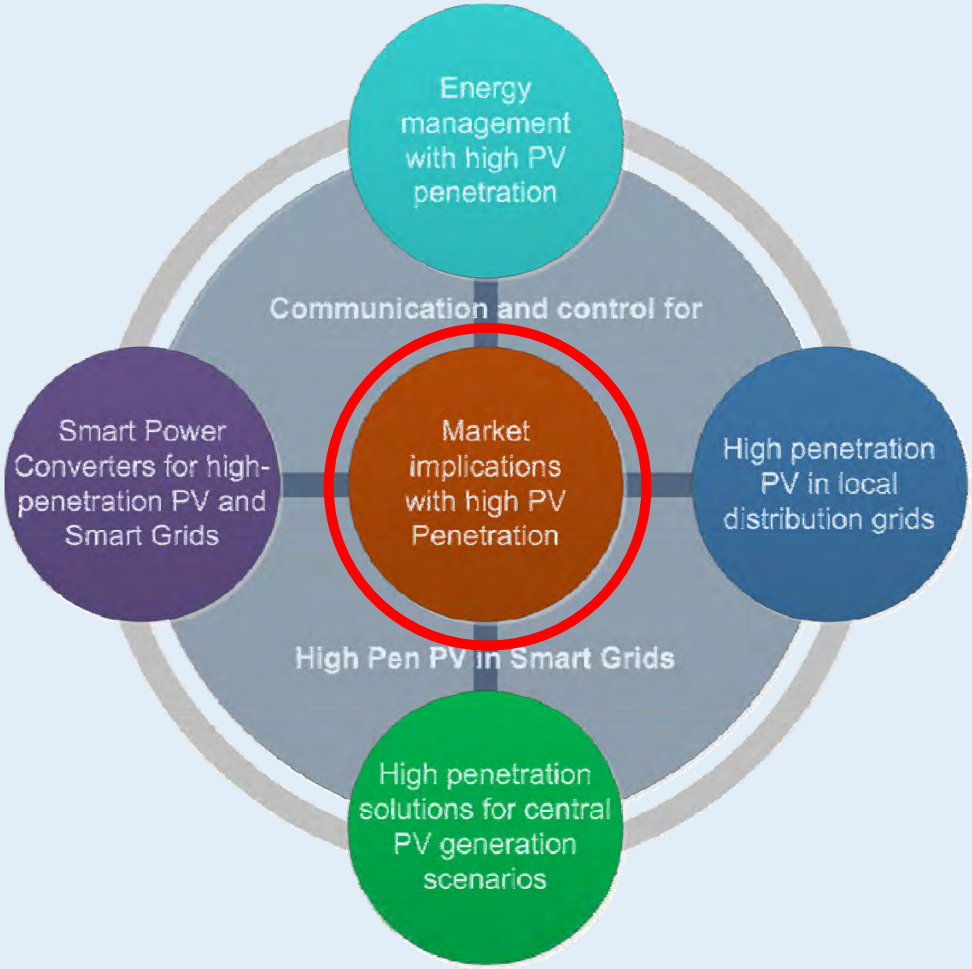
PVPS

Motivation for PVPS Task 14 2.0 …and a look forward:

- Massive technical developments are currently ongoing following the increasing penetration of PV
- New fundamental challenges arise with PV becoming a game changer on the bulk power system level
- Bringing together technical (=Task 14) and non-technical expertise (e.g. regarding market design with PV) is strongly needed.
- There is a strong interest by the participants in continuation and extension of the successful work

IEA PVPS Task 14 Achievements so far (examples)

- PV forecasting – state of the art
- Analysis of energy management systems and local storages to improve the penetration of PV in local grid
- Distribution grid case studies of 11 countries
- Report on current experiences of high PV penetration and active / reactive power control strategies in distribution grids
- Report on Recommendations for managing the transition from One-Directional to Bi-Directional Distribution Grids
- Report “Power system operation planning with PV integration”
- …



TASK 14 2.0 - STRUCTURE

PVPS

PVPS

TASK 15 – BUILDING INTEGRATED PHOTOVOLTAICS (STARTING 2015)

PVPS Task 15 - BIPV

Subtask A: BIPV database 2.0 by Tjerk Reijenga (NL)

Subtask B: Economic transition towards sound business models (?, NL)

Subtask C: International framework for BIPV specifications (Fraunhofer (GER); International Regulations, Standards and Requirements with relevance for BIPV products

Subtask D: Environmental assessment issues (NL)

Subtask E: Demonstration projects (?? – A??)

Subtask F: Dissemination (NL)

PVPS

IEA - Electricity coordination Group

Leitung: IEA Office –
Business Unit Renewable Energy (Paolo Frankl)

Wind,
Ocean Technologies,
PVPS,
ENARD, ISGAN,
DSM,
Superconductivity,
Hybrid Electric Vehicles,
Energy conservation through energy storage (ECES),
Greenhouse Gas R&D,
RE Technological Deployment,
Efficient Electrical End-Use Equipment

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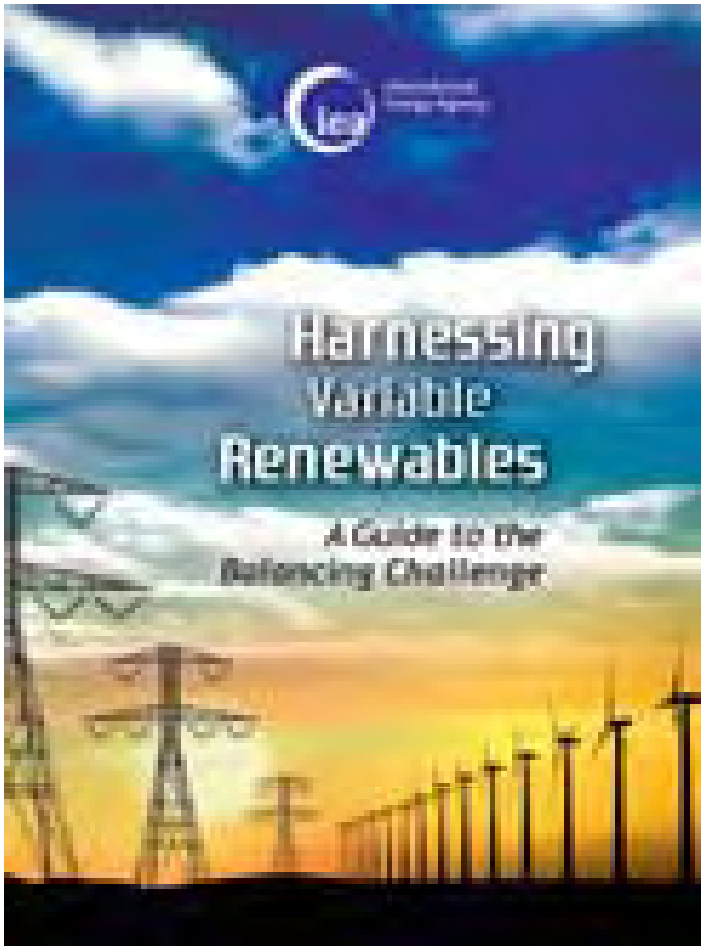
TECHNIKUM WIEN

The GIVAR Project – Phase I



International Energy Agency

… all about Flexibility…

Author: Hugo Chandler, IEA

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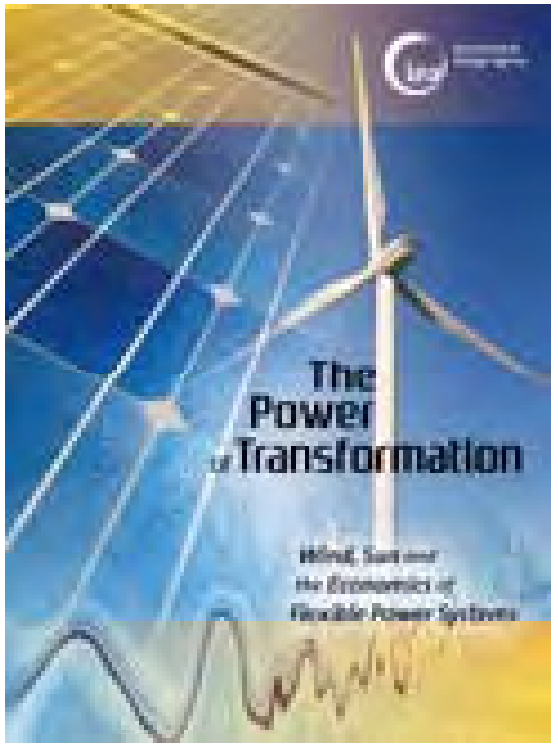
The GIVAR Project II

It expands the work to also include an economic assessment of different flexibility options and assessing their relative cost/benefit.



12. Österr. Photovoltaik Tagung 2014

3.- 5. November

Linz Redoutensäle

TECHNOLOGIE PLATTFORM PHOTOVOLTAIK

bmvit Bundesministerium für Verkehr, Innovation und Technologie

Energie LAND OBERÖSTERREICH

ENERGIE AG Oberösterreich Wir denken an morgen

OÖENERGIESPARVERBAND

IEA Wind Task 27

- 1st period from 2008 – 2011: Development and Deployment of Small Wind Turbine Labels for Consumers
- Extension from 2012 – 2016: Small Wind Turbines in High Turbulence Sites

SWT (Type Darrieus-H) in Hamburg

Objectives:

- Deployment of Small Wind Turbine Labels for Consumers
- Improvement of the general understanding of highly turbulent sites and the impacts on small wind turbines (production, lifetime, maintenance,…)
- Development of a recommended practice for operation and design of Small Wind Turbines in in highly turbulent sites

SWT at train station Berlin

National activities

- **Establishment of a national working group "Small Wind Power Austria"**
- **Organization of the first Small Wind conference in Austria, planned for December 2015**

SWT on the ENERGYbase

Project “Urban Wind Energy”

- **Development of methods for the assessment of small wind turbines in urban areas**
- **investigation of two small wind turbines at urban and rural site**

SWT in Köln

Project “Small Wind Power Systems”

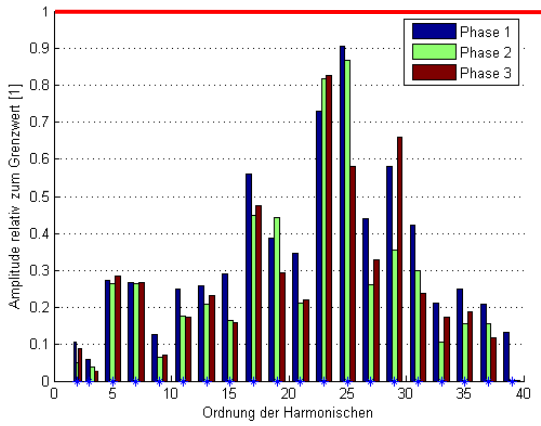
- **Test infrastructure “Energieforschungspark Lichtenegg”**
- **Development of a simplified certification procedure**

System integration

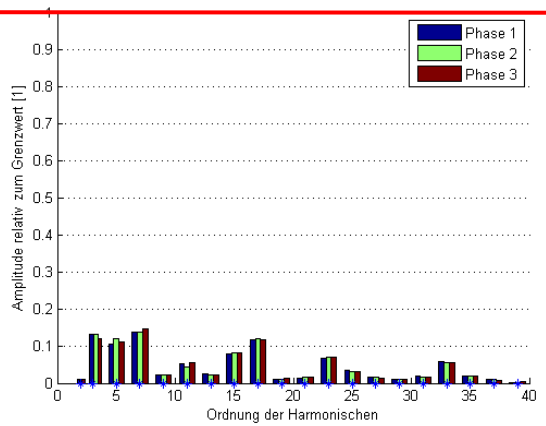
Into the electricity system – Power Quality

- **Harmonics**
- **Flicker**

SWT 4.8 kW with inverter

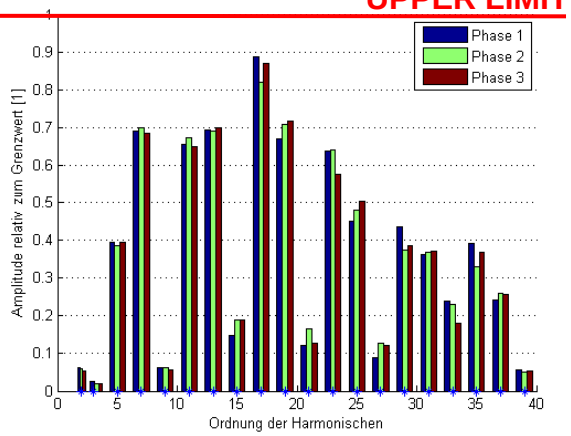


SWT 6 kW without inverter

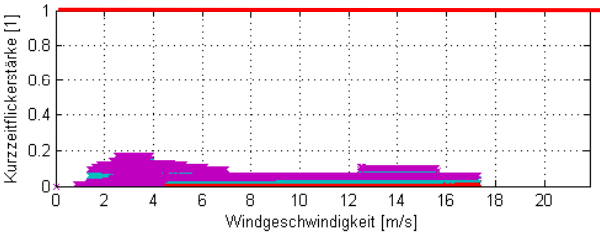


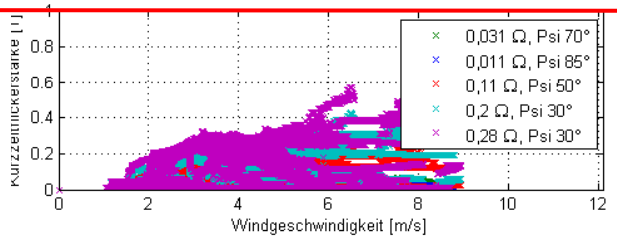
PV 10kWPeak

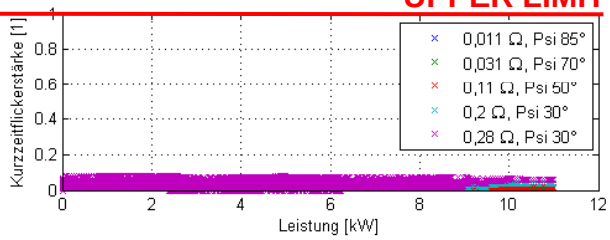
UPPER LIMIT



UPPER LIMIT



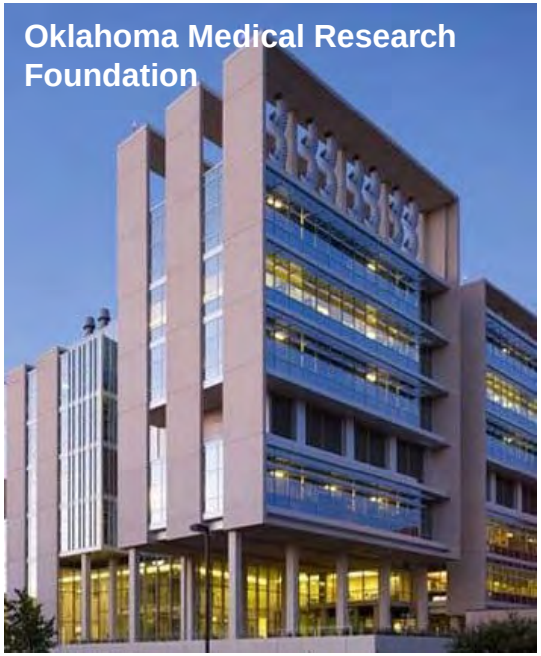




System integration

Into the built environment


Strata SE1 London


Oklahoma Medical Research Foundation


Bahrain World Trade Centre

Thank you for your attention!

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